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ABSTRACT

The purpose of this paper is to highlight some of the most significant trends likely to affect agricultural resource conservation activities, to discuss their significance to policy development and program management and implementation, and to make policy and program recommendations. In November 1986, 25 representatives from academia, farming ranching, commodity groups, agricultural organizations, and agribusiness met with Soil Conservation Service (SCS) personnel to discuss and respond to the issues raised in a draft version of this paper. Their reactions and recommendations have been incorporated into the paper. Four broad concerns are identified: the changing structure of agriculture, the changing structure of rural communities, changing agricultural policies, and technological changes, as well as others changes in the agricultural environment (such as financial changes). Discussion within concerns touches on changes in farm ownership, increased off-farm employment, emerging conservation coalitions, changing patterns of communication, new legislative initiatives, biotechnology, information and equipment technologies, international factors, etc. Implications conclude each large section. Issues raised in this paper will set the stage for providing modifications, changes, and additions to the program initiatives of the SCS National Conservation Program that has provided priorities for United States Department of Agriculture activities since 1982. (JMM)

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Soil Conservation Service

Assessment and Planning

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Agricultural Trends and Resource Conservation: Implications and Issues

Staff Report
Appraisal and Program Development Division
Economics and Social Sciences Division

August 1987

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Agricultural Trends and Resource Conservation:

Implications and Issues

A Symposium Proceedings

November 3-5, 1986

Washington, D.C.

Organized by:

Appraisal and Program Development Division

Economics and Social Sciences Division

Soil Conservation Service

U.S. Department of Agriculture

This symposium addressed major issues which are of concern in formulating resource conservation policy and program management and implementation. The paper reflects the reactions of the group and their recommendations. No attempt has been made to achieve consensus. The report and recommendations are those of the group and do not represent the position of the Soil Conservation Service or the U.S. Department of Agriculture.

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AGRICULTURAL TRENDS AND RESOURCE CONSERVATION: IMPLICATIONS AND ISSUES

Introduction

Newspaper headlines, television documentaries and public demonstrations have focused national attention in the past year on a major crisis in American agriculture. Farm foreclosures, rural bank failures, and the resulting social trauma in rural communities provide dramatic evidence of massive changes in the agricultural sector that began more than 30 years ago. Many changes have occurred in the "structure of agriculture"; that is, the organization and control of farm resources. They include changes in the scale, distribution and ownership of farms; changes in farm financial status; and technical changes in farm operation. Concurrent with these events have been changes in the social and demographic characteristics of rural communities, changes in the rural infrastructure providing farm and personal services, and, most recently, changes in government policies and programs relative to soil and water conservation.

It is not the purpose of this paper to discuss these changes in detail. They are well documented in sociological and economic literature, and in numerous publications from land-grant universities, government agencies, and private agricultural organizations. The purpose of this paper is to highlight some of the most significant trends likely to affect resource

conservation activities, to discuss their significance to policy development and program management and implementation, and to make policy and program recommendations. Ultimately, the issues raised in this paper, and the related recommendations, will set the stage for the development of the 1987 RCA Soil and Water Conservation Program Update under the leadership of the Soil Conservation Service (SCS). This update will provide modifications, changes and additions to the program initiatives of the SCS National Conservation Program that provided priorities for USDA activities since 1982.

In November, 1986, 25 representatives from academia, farming, ranching, commodity groups, agricultural organizations, and agribusiness met in Washington, D.C. with Soil Conservation Service personnel to discuss and respond to the issues raised in a draft version of this paper. The reactions of this group and their recommendations have been incorporated into the paper. It should be noted that no attempt was made to achieve concensus; the paper reflects the diverse views of all of the members of the panel.

THE CHANGING STRUCTURE OF AGRICULTURE

Changes In The Size and Distribution Of Farms

The change in the size and distribution of farms has been one of the most significant farm structural changes in recent years. The greatest impact has been on intermediate-size farms--those which are typically viewed as the "backbone of American agriculture" (U.S. Congress, 1986). The number of these farms has declined substantially, with a concurrent increase in

small farms, as well as a trend toward concentration of sales, assets, and profits among a small number of very large farms. Forty percent of U.S. farms consist of fewer than 50 acres, while 7 percent have 1,000 acres or more (Dorow, 1984). The overall decline of farms may continue, although at a slower pace. It seems likely, however, that a dualistic structure of farm size will continue to evolve with large and small farms surviving and the number of middle size farms shrinking further. An important point is that the decline in numbers may not be as precipitous as some observers have projected because of the resiliency of small farmers, especially part-time farmers. In spite of the high percentage of small and part-time farms, however, large farms account for most of the agricultural productivity. By 2000, the U.S. Office of Technology Assessment predicts that approximately 50,000 of the largest farms will account for 75 percent of all agricultural production (U.S. Congress, 1986).

Issue: How will changes in farm size and distribution affect resource conservation?

Research in the area of adoption and diffusion of conservation practices and resource managment systems associates larger farms with adoption of conservation measures (See, for example, Carlson, Dillman and Lassey, 1981; Choi and Coughenour, 1979; Lasley and Nolan, 1981; Nowak and Korsching, 1981). However, the statistical association of this relationship is weak. Many large farms do not have conservation measures on the land. One possible reason is that large farms operate land that is less in need of conservation. The extent of the farm's resource problem was not usually considered in these studies. Therefore, the

effect that the trend toward large farms will have on the future application of conservation systems is inconclusive at this stage.

On the other hand, some producers operating small farms have limitations in economies of scale, capital, equipment, and management skills. These factors make it difficult for this group to adopt conservation resource management systems. Small farms will continue to be a major part of the rural community and farm sector, but a high number of these producers operate marginal and highly erosive land. Because limited resource farmers typically have low participation rates in conservation programs, they may need intense implementation efforts and special incentives directed toward them to influence them to adopt conservation systems.

Another important change which has been occurring is the conversion of agricultural land to development and highways. This is especially evident around metropolitan areas on the West coast, and in the Northeast. In areas of agricultural conversions, conservation activities necessarily change from working with members of the farming community to working with such groups as developers and state highway commissions.

Increases In Off-Farm Employment

There are many farmers who derive most of their income from off-farm labor. These farmers are a diverse group. Some may work off the farm in order to enjoy the quality of life that rural living provides--and that farming alone cannot support. Others may be traditional family farmers who maintain a tenuous hold on their land by supplementing farm income with off-farm labor; still others may be upper-income professional and

technical people who enjoy farming more as a hobby than as an occupation. A majority of farm operators derive some income from off-farm employment. In 1982, for example, all farms had an average net income from farming of $9,976 (this figure is low for full-time farmers and high for small farmers), but they had an average off-farm income of $17,601 (U.S. Congress, 1986).

Issue: How will changes in the sources of farmers' incomes affect resource conservation?

Insofar as off-farm employment increases the farmer's ability to afford conservation practices, the trend toward more off-farm income should be a positive one for conservation. For many farmers, however, the competition for these non-farm dollars will be keen. This is especially true for the small and moderate-size farmers, who frequently need off-farm income just to maintain a subsistence level of existence on the farm. The positive influence of off-farm income on conservation will probably be felt most among large farmers and those in the small or part-time category who do not depend on the farm as their primary source of income.

The amount of time that a farmer and other family members work off the farm also has implications for the types of conservation practices that are likely to be applied. Small- and medium-size farms, in particular, depend primarily on family members for their farm labor. When farming activities take place in the evening and on weekends, less labor-intensive practices such as conservation tillage and rotations are more likely to be accepted than labor-intensive practices such as

terraces and grassed waterways. Other, less labor-intensive conservation practices may have to be designed and recommended in order to meet the needs of part-time farmers. Part-time farmers may also have less time to seek out information and assistance on conservation practices, because of conflicting demands of on-farm and off-farm interests.

Changes In Farm Ownership

Farm ownership patterns have undergone significant changes. Approximately forty percent of the farmland in the U.S. is owned by people who do not farm. However, very little information exists on where these "absentee owners" reside. An educated guess is that many of these people live in the same county as the farmland they rent, while a smaller percentage of owners live out-of-county. Knowledge of resource degradation, participation in USDA programs, and experience with new farming techniques may differ enormously between and among in-county and out-of-county landowners. In the future, we can expect more shifts in ownership patterns, especially in those regions that are hardest hit by the farm crisis. These owners will likely be "out-of-county" or institutional owners.

We have also seen an increase in "part owners"--farmers who own some land and rent other land--and in acreage that is owned and managed by partnerships, family-held corporations and other corporations (Dorow, 1984). The current farm crisis has accelerated these trends, as well as increasing the amount of farmland that is owned and/or managed by banking institutions, professional farm management firms, insurance companies and other financial institutions. According to AgriFinance magazine,

professional farm management companies now manage nearly 59 million acres of American farmland, or 16 percent of all cultivated acres in the United States (Schneider, 1986). Millions of these acres are managed under contract with lenders such as the Farmers Home Administration and the Farm Credit Corporation of America. Since U.S. Department of Agriculture data indicate that nearly one-third of all farms with annual sales of over $40,000 show high debt loads, and, in the current agricultural climate, farmers are unable to generate sufficient cash to pay their bills, these trends are likely to continue (U.S. Department of Agriculture, 1985).

Private Property Rights and Responsibilities

Private property ownership in the United States is founded on a "fee simple" system in which society grants to the individual almost complete control. Private ownership traditionally has encompassed the rights to possess, occupy, hold, transfer, buy, sell, mortgage, lease, subdivide, consolidate, use, exploit, conserve, improve, bequeath, and give. Rights are not, however, unequivocally exercised in all circumstances, because society also imposes responsibilities and duties on its members in order to avoid infringement upon the rights, health, and safety of others.

The importance of private property ownership in our social and economic structure has been a fundamental premise of the free enterprise system. Dating back to colonial days, the philosophy of independent and exclusive rights of property ownership has been revered as the cornerstone of our society. This philosophy dates back to the

establishment of our Nation and the beliefs about the individual's private rights and freedoms which are frequently attributed to the writings of Thomas Jefferson.

Even as patterns and styles of property ownership have changed, the belief in the right of property owners to manage their land as they think best remains strong. The environmental movement has challenged some conventional property rights by holding that land users are responsible for adverse societal impacts of their uses of soil and water. Most land users, however, hold an environmental/conservation ethic and believe that good stewardship of the land is their responsibility. Soil conservation programs and policies need to maintain a balanced approach that recognizes the rights of the individual property owner as well as society's right to a healthy environment.

Issue: How will changing patterns of land ownership affect resource conservation?

Research on adoption of conservation practices relative to land tenure has been inconclusive, although conventional wisdom has supported the idea that renters are less likely to be good stewards of the land than full owner-operators. One recent analysis has concluded that "Despite past and present investigators' efforts, the question of whether rented land receives less, the same or more erosion control than owner-operated land remains an enigma. Very little clear evidence has been produced to support or refute any of the three possible outcomes due to the

difficulty of constructing rigorous tests" (Ervin, 1986). Even less well known is conservation behavior of farmers with both rented and owned land. Research on adoption patterns usually compares full owners with full renters, rather than examining farms combining owned and rented land. What can be expected of these farmers? Is it likely that they will behave differently on the land that they rent than on the land that they own? As of now, we have limited data on which to base an educated judgement.

There appears to be little information on the conservation behavior of farm management firms. One might expect that conservation decisions in these situations would be based exclusively on economic considerations, while owner-operators might be motivated by other factors such as the land ethic, public service, personal satisfaction, and preserving an inheritance for future generations. All of this is problematic, however, since the decision processes of these firms in regard to conservation are not well understood.

Since more and more farmland is being managed by large agribusiness corporations, farm management firms, and other absentee landowners, it appears that the economic benefits of conservation applications will be an increasingly significant factor in the adoption process. Insofar as conservation agencies and organizations can demonstrate that conservation systems can be cost effective, they should be successful in promoting their use. Conservation compliance policies should also be effective, since many landowners and managers are likely to be participants or major advisors to participants in commodity and other agricultural programs.

Implications of Farm Structural Changes

The following implications were derived from formal papers and informal discussions of the panel:

1. Farm ownership changes occurring as a result of the financial crisis will lead to more absentee owners, more financial institution ownership, increased professional farm management activity and more government- (FmHA) owned land. These changes will lead to demographic shifts in ownership. These new owners and firms will likely have a short-term management horizon to maximize revenue in lieu of long-term conservation goals.
2. Along with changes in farm ownership, individual farm organizations have also changed. Farm specialization affects use of crop management practices and available alternatives. Larger farms and crop-support programs lead to farm specialization, which reduces crop rotations and also leads to increased chemical use. This trend, if it proceeds unabated, will limit alternatives for promoting soil and water conservation. At the same time, reduced input agriculture in conjunction with management styles that use rotations and nitrogen-fixing crops may become a legitimate countertrend to specialization. Although economic savings through reduced input costs is probably the major reason driving this trend, the secondary benefit will be to protect soil and water resources.
3. Small farms will continue to be a major part of the rural community and farm sector. The numbers of producers will continue to be high, with many of these farms being located on marginal and highly erosive land. Small farmers, most likely, will have limited resources and

low participation rates in conservation programs. A majority of these farmers will be part-time with an off-farm income.

4. SCS clienteles will continue to diversify to include more part-time farmers, minority farmers, limited resource farmers, institutional owners and others. Field staffs must be trained to communicate with these groups, and new programs must be designed to meet their unique needs.
5. Current distinctions between family farms and corporate farms are not important, as most incorporated farms are family corporations.

THE CHANGING STRUCTURE OF RURAL COMMUNITIES

Emerging Conservation Coalitions

Changes in the structure of agriculture have also been accompanied by changes in the social and demographic characteristics of rural communities. Farming no longer dominates much of rural America--only 15 percent of the rural population of the U.S. is in farming--and, while some rural communities depend almost entirely on agriculture for their existence, others have diversified sufficiently that fluctuations in the farm economy have little impact on them. Some populations in rural communities may have a limited understanding of, or experience in farming; they may be almost as far removed from it as their more distant urban neighbors. These communities may assign low priority to farm-related issues unless they can see some relevance to their own lives, such as the impacts of erosion on the quality of their drinking water or recreation.

As both urban and rural people increase their recognition of off-site impacts of erosion, the formation of new conservation interest groups and coalitions has resulted. Soil and water conservation is no longer the exclusive domain of soil and water conservation districts and state and Federal agencies. New participants, such as the National Wildlife Federation, the Sierra Club, the National Audubon Society, and other environmental groups support the assault on soil and water resource problems. Indeed, these new coalitions influenced the passage of the strong soil and water resource conservation title of the 1985 Food Security Act (Farm Bill).

Issue: How can conservation coalitions among local agencies, organizations and informal groups be established and maintained?

Research indicates that conservation is more likely to be successful if innovative farmers are supported by the community. The emergence of new coalitions provides the opportunity for achieving community support, even in those communities where the agricultural component of the population is small. At the same time, however, there may be the risk of conflict, as coalition members with diverse values and goals work together to solve conservation problems.

Changing Patterns Of Communication

The agricultural world in which resource agencies and organizations must function over the next decade is far different from the one that existed when the Soil Conservation Service was founded in 1935. In those days, family farms dominated the agricultural scene, and small rural

communities provided the forum for communication about farming methods, new agricultural products and conservation practices. "Elmer", the key influential farmer in the community to whom other farmers looked for advice and information, was sought as a good role model for the introduction of new conservation practices. If "Elmer" used a new practice, the argument went, other farmers would soon emulate him. Agency field staffs also looked for "ready, willing and able" farmers--those who would be most receptive to conservation technical assistance, and most able to implement the conservation practice on their own land.

Although rural communities like this still exist in highly agricultural areas, the setting for soil conservation technical assistance and education is quite different today in many areas of the country. Most of the "ready, willing and able farmers" (and their sons and daughters) with whom conservation agencies have worked since 1935 have already applied soil conservation practices. Few rural communities have a single "Elmer" in a position of influence; now there may be several "Elmers", one for each interest group and type of farmer, and their sphere of influence may extend far beyond community boundaries. In areas where large farms predominate, the small, local community may be either nonexistent or insignificant in its impact on local farmers, who look to more distant communities for their social, technical, and information support systems.

Finally, as decision-making becomes more complex, farmers are likely to adopt new communication technologies and abandon older patterns of

communication that may seem less reliable. Farmer adoption of microcomputers and telecommunications systems is a good example.

The legal system may form a new backdrop from which two or more parties communicate with one another. The issues of legal responsibility and liability relate to several societal trends: The formation of nonagricultural interest groups who take it upon themselves to monitor environmental quality; present, past, and future conservation work on water resource projects; and on-farm conservation systems that heavily depend on agrichemical applications. Because society has become increasingly litigious, conservation organizations may be involved in more lawsuits than they have been in the past. Several possibilities exist: Dissatisfied nonagricultural interest groups or individuals may seek solutions through the legal systems; conservation organizations may be sued if dams breach causing injury or death; and lawsuits may result if water use in one area impacts the availability of water in other areas.

Issue: What new patterns of communication must be established and utilized in order to provide education and technical assistance for resource conservation?

Research has shown us that good information and education about conservation is a necessary, if not sufficient, condition for adoption of conservation technologies to take place. Several studies have indicated that farmers view agricultural magazines, government agencies, and other farmers using the practice as reliable sources of conservation

information (Bultena, et. al, 1984). Will this continue to be true as large, nonfamily farmers become more removed from local community networks and part-time farmers may be too busy to be a part of them?

In the future, agency personnel working in the field may find themselves working with farmers and landowners who have not applied soil conservation practices before, and who may be unfamiliar with those who provide technical and financial assistance to install them. They may need to look for new avenues of communication, and new types of "key community influentials" to achieve their goals. They may need to seek out those who are most responsible for resource problems, rather than waiting for the "ready, willing and able". Finally, they may need to "market" conservation, by using many of the tools and strategies that marketing specialists have demonstrated to be effective in the private sector.

Implications of Changes in Rural Communities

1. The declining importance and visibility of agriculture, not only in urban areas, but also in many rural areas, is a significant change for soil and water conservation. This means that agriculturalists are losing some of their political "clout". It also means that goals other than agricultural productivity may need to be emphasized (e.g. off-site impacts, environmental protection) to other groups. With these new emphases, there will be a need to form new coalitions with environmental and other interest groups in order to achieve conservation goals. In addition, the agricultural community may

need to demonstrate to these groups that they have a strong stake in environmentally-safe agricultural products.

2. The demise of many rural communities, and the continuing decline of others because of poor economic conditions, will result in a less supportive environment for conservation. There may be fewer opportunities for off-farm employment in these communities, so that farmers have less cash to invest in conservation. As the community infrastructure deteriorates, and local services such as health care and education decline, it may be more difficult to persuade qualified professionals such as soil conservationists to locate in these areas. As a result, farmers and ranchers may not be able to obtain the one-on-one skilled assistance to which they are accustomed.

3. On the other hand, in areas where there are opportunities for off-farm employment, there may be an increase in part-time farming. This implies that more dollars may be available for conservation. However, it also may mean (1) more marginal land brought into production, (2) greater use of technology such as chemicals, in order to save labor, (3) a willingness to risk innovations, and (4) greater ecological awareness.

4. More emphasis is being focused on soil and water quality and quantity with regard to off-site public benefits. As a result, urban attitudes may become major factors in designing and managing future conservation policies and programs. The future seems to hold the possibility of increased EPA input, water quality regulations, and increased technical regulation. Conservation organizations will need to direct their efforts toward development of procedures for identifying water quality and quantity problems, and toward

identifying conservation measures to address these problems. Urban audiences will need to be involved.

5. Conservation programs that retire farmland or rangeland have the potential to negatively impact rural communities through decreased agribusiness and related sales, decreased demand for farm labor, and a diminished tax base. This may be particularly true in areas where a monocultural agriculture dominates.
6. A healthy farm economy depends at least partially on a healthy rural economy. Rural development activities, such as RC & D, may be needed to provide more opportunities for off-farm employment.
7. Conservation organizations may need to build coalitions and anticipate situations that could result in legal battles. Moreover, they may also need to consider ways to insure legal representation, if legal fights cannot be avoided due to past activities.

CHANGING AGRICULTURAL POLICIES

New Legislative Initiatives

Many resource conservationists view the resource conservation title of the Food Security Act of 1985 as the most important legislation to affect soil and water conservation since the 1930's legislation that resulted in the formation of conservation districts and the Soil Conservation Service. Surely, the conservation reserve, conservation compliance, swampbuster, and sodbuster components of the bill will significantly impact the nation's pattern of use of cropland over the next 10 years and beyond. In the first sign-up year alone, the Conservation Reserve Program has removed nearly 19 million acres of highly-erodible land from production. By 1995, all highly erodible cropland must be protected by

conservation systems in order for the landowner to participate in Department of Agriculture commodity and other support programs. Soil and water conservation districts and USDA have the responsibility for implementing these initiatives.

Issue: What impact will the new legislation have on the role of resource conservation professionals and on program implementation strategies?

Implementation of the conservation title of the Food Security Act will require resource conservation professionals and USDA agencies to assume a very different role from the one they have played in the past. Until now, conservation programs have depended entirely on the voluntary adoption of conservation systems, and field staffs viewed themselves as partners with farmers and landowners in conservation efforts. Although volunteerism and partnerships are still strong aspects of agency activities, a new dimension has been added by the legislation. That dimension is probably best characterized by the word "determination". It is now the responsibility of SCS to "make determinations" of erodibility, eligibility, and adequacy of conservation plan implementation. The role change for the conservationist from "good guy" to a "quasi-regulator" will be a difficult one, particularly for those who have a long-established community image as a friend of local farmers.

Preliminary research also indicates that participation in these programs is not assured--even with the conservation compliance "carrot" in place--and the resource problems cannot be solved entirely with the new

initiative. Reichelderfer (1985) has concluded that "only about one-third of U.S. cropland with excessive soil erosion rates is operated by farmers who might be influenced to reduce erosion if changes were made in the U.S. Department of Agriculture's commodity and soil conservation program", and that efforts to increase the consistency of the programs would "contribute little to overcoming the Nation's total erosion problem." However, this study did not take into account other USDA programs for which a farmer would be ineligible for such as FMHA operating loans, crop insurance, storage payments, etc. When these programs are included, preliminary field research indicates that only 20 percent of the farmers would not be affected. Other incentives and strategies will still be needed to achieve conservation goals for these remaining farmers and ranchers.

Large farmers are now limited to the amount of payments they can receive from farm programs. However, in some cases, they have circumvented these limits by forming partnerships so that payments can be legitimately distributed among members of the partnership. This has generated some pressure for lowering payment limits and tightening requirements for program participation. At this time, the policies remain the same. Should they change, the compliance section of the 1985 Food Security Act would become meaningless to those farmers operating large blocks of land. In short, the "carrot" would not be sufficient incentive to induce participation in conservation activities.

State and local governments have also become more directly involved in recent years. Significant legislation has been enacted at the state

level in many states, and state and local governments have been active in working to address conservation problems within their jurisdictions. Strategies need to be identified which encourage conservation in an environment characterized by excess capacity (overproduction) and financial stress. Federal fiscal policies and exogenous forces on agricultural policies tend to work against soil and water conservation. This is complicated by the fact that conservation activites are strictly voluntary and flexible to meet a multitude of state and local needs. New strategies need to minimize agricultural production costs, diversify farm production enterprises, and maintain productivity with reduced inputs of expensive energy and chemicals, with the overall objective of stabilizing income. This leads to the integration of conservation and farming methods for wider adoption of reduced input farming.

Conservation Funding

Since 1935, the clearly defined mission of SCS has been to save soil. Presently, this mission is being questioned by people outside the formal conservation organizations as well as by those working in conservation. The fundamental question -- What is the goal of saving soil? -- has been asked. The historical response has been, "It is the right thing to do." The current response seems to be evolving toward saving soil in order to maintain productivity, to keep farmers in business, as well as to maintain the resource base for future generations. Importantly, the mission has also expanded to consider sedimentation, surface and ground water quality and quantity, and other off-site public benefits such as recreation and wildlife habitat resulting from soil and water conservation.

At the same time the mission of SCS is expanding, federal dollars for conservation have been declining over the past six years, with SCS alone losing approximately one billion dollars in budgetary appropriations. For SCS, this has caused realignment of priorities, reductions in staff, and some consolidation of area and field offices. Increased conservation funding is an obvious need, especially in light of the monumental increase in conservation planning that will result from the 1985 Farm Bill. However, the mounting Federal deficit forms a wall that blocks increases in Federal funding for conservation. Some state and local funding for conservation efforts has increased substantially, but it is still short of what is needed for updating conservation plans and working with landowners who have not practiced conservation before. Furthermore, state and local funding will not, in all likelihood, increase enough to meet future needs. Consequently, other sources of funding and assistance are needed. For example, joint efforts with industry to disseminate mutually beneficial conservation information and technical assistance, increased cooperative efforts among public agencies, and cooperative research projects with universities, industry, and government are all worthwhile pursuits.

Because of the off-site impacts of agricultural production, urban attitudes are becoming a major factor in designing future conservation programs and policies. In a related sense, urbanites and environmental groups will become more important in the future funding of conservation programs. The future seems to hold the possibility of increased Environmental Protection Agency (EPA) input, water quality regulations, and increased technical regulation, as evidenced by the 1985 Food Security Act.

Implications of Conservation Policies

1. Overproduction/over-capacity is the major issue facing agriculture today. In the extreme, overproduction can lead either to mandatory controls or a market-oriented approach to agricultural production. A third possibility is that the situation would remain the same. Mandatory production controls could ensure that agriculture programs fill consumption needs, and, at the same time, contain strong conservation components. Conservation could be implemented through price incentives, or less attractive, as purely mandatory programs. The market approach could provide more opportunities for a conservation reserve or for conservation easements; that is, if prices for products stabilize at a low level, then Government payments could benefit producers. However, in spite of varying degrees of support for either position, the status quo is more in the realm of political reality. Presently, conservation can be increased through strengthening the Conservation Reserve Program (CRP) and providing more technical and financial assistance.
2. The profit position for many producers is in a crisis situation. As much as 30 percent of the land being cropped could change ownership or tenancy over the next 5 years.
3. The national deficit will constrain the type of farm program that can be designed to resolve the financial and excess production problems in agriculture.
4. There will be public pressures emerging to regulate agriculture in order to solve erosion, water quality and other environmental problems.

5. Profitability of agriculture will depend on the success of the farm programs to resolve the financial situation. Lower program payments to large farmers might become a disincentive for them to follow the conservation provisions of FSA.
6. Commodity programs most likely will continue to be contrary to conservation objectives.
7. Conservation will suffer if budgetary cutbacks are directed at conservation programs. But if commodity program budgets decrease and conservation budgets increase, conservation activities would probably increase. However, there may be some tradeoffs if commodity program reductions decrease cash flow, thereby reducing the funds available for conservation.
8. Because the amount of agency dollars is declining, renewed efforts to stabilize or increase funding are needed. Other sources of funding are also needed, such as: joint efforts with industry to disseminate information, and multi-agency/university cooperative research projects. The overall trend of declining agency budgets will negatively affect staff levels, decrease programs, reduce services and could lead to the consolidation of USDA agencies.
9. It is difficult to generalize agricultural policies nationwide. Differences in regions will continue to widen, and a stronger "bicoastal" economy will continue to emerge. A single national soil conservation policy just will not work under these conditions.

TECHNOLOGICAL CHANGES

Biotechnology

Advances in biotechnology and genetic engineering research are perhaps the most exciting application and research agendas occurring today. The

techniques/products of biotechnology include industrial-microbiological production of proteins such as animal growth hormones, nitrogen-fixing plants; in vitro and in vivo products; drought tolerant, salt resistant, and herbicide/pesticide resistant plants; and embryo transfers. This expanding body of knowledge has moved from the realm of science fiction to the realm of scientific reality in only a few decades. Animal production has already benefited from protein production, gene insertion, and embryo transfers. Although slightly behind animal applications, biotechnological activities on plants may have even greater potential to increase agricultural production capabilities (U.S. Congress, 1986).

In spite of the media glamor that surrounds this type of technology, biotechnology has not yet revolutionized agriculture. Thus far, there are still technical constraints limiting these new technologies; e.g., internal plant chemical functions are not fully understood (Butler and Schmid, 1984: 1). Still, examples of the application of biotechnology are slowly but steadily increasing. Recombinant DNA techniques can now produce growth hormones for dairy cows that increase the feed efficiency of milk production and greatly increase milk production per cow (U.S. Congress, 1986). The USDA has recently certified a new tomato hybrid. This high-yield, disease-resistant tomato plant has a 20-percent higher solid content than leading commercial varieties, which makes it cost effective to produce ketchup, paste, and soups (Wall Street Journal, 1986).

Biotechnological applications can eventually have a tremendous impact on the structure of agriculture, especially if they are expensive to use initially. As with other new technologies, the early adopters will most likely be those who can afford to purchase the manufactured products. One estimate suggests that 70 percent of the largest farms will adopt some biotechnologies and information technologies by 2000 (U.S. Congress, 1986). This pattern will add to technical advantages that larger farms/ranches already have over middle-sized and smaller farms/ranches.

Issue: What impact will biotechnology have on conservation programs and activities?

The environmental consequences of applying biotechnology are neither inevitable or inescapable. Initial assessments indicate that these emerging technologies will reduce individual plant, land and water requirements for an equal amount of agricultural production. Thus, some environmental consequences may be positive. For example, higher yields may mean less land that needs cultivation; drought tolerant plans will reduce irrigation requirements; increased meat production per animal with similar feed intake will reduce forage and feed grain needs; and genetically altered plants can reduce the need for applications of fertilizer, pesticides, and herbicides.

In a negative scenario, the intentional and unintentional release of new forms of life may pose a significant threat to the environment. Both proponents and opponents agree that more research needs to be conducted to assess potential benefits and risks when releasing new genetic forms

(U.S. Congress, 1981). In extreme cases, some firms may gear their activities toward promoting their products, while ignoring environmental consequences. For these new firms, more concern about the impact of biotechnologies on environment and human health is needed. Thus far, questions about environmental impacts deserve far more regulatory scrutiny and research than the Federal Government has been willing to initiate. Some firms presently are genetically altering plants/trees so they are resistant to a brand of herbicide or pesticide. This could greatly increase agrichemical applications.

Biotechnological application will probably have a large impact on plant-crop technologies where single traits are modified (i.e., herbicide-tolerant crop varieties). This is the most controversial area of technology, and public confidence has already been shaken by current findings on chemical contamination. Public pressure will most likely build to eliminate many chemical products from the market. In the future, new chemical products that might pose an increased threat to people, water, and wildlife will probably be closely monitored. However, the next generation of biotechnology is expected to include relatively benign chemicals based on naturally-occurring substances (e.g. plant growth regulators). The improvements in plant biotechnology will probably vary significantly from one crop to another, as will the resource and environmental impacts. Nitrogen-fixing cereal grains could reduce the use of petroleum-based fertilizer, but also increase land use. Additional land might be cultivated to make up for decreases in productivity that occur due to focusing a plant's energy on fixing nitrogen rather than producing biomass (Kenney et al., 1982).

Many biotechnologies are orientated to monoculture production systems rather than to agricultural resource conservation. Thus, they are more energy-and nutrient-input directed. However, technology may be directed to a variety of goals. Research can just as easily be directed towards reduction of purchased inputs and more diverse cropping systems in the interest of environmental quality. This can serve the producers' financial needs as well as the needs of society. It is also very probable that these alternative agriculture systems can be focused on conservation so that monetary incentives would not be needed to encourage conservation participation. Thus, research to reduce present high chemical dependency, while maintaining a reasonable profit is needed.

Most new crop technology is more capital intensive than the current seed and chemical inputs sytem and will most likely be adopted by the larger farm units. It will also require a high degree of managment expertise. This high-cost technology will receive unprecedented scrutiny by farmers and ranchers because of the recent financial crisis, some of which was brought about by large capital expenditures for new machinery technology.

Finally, "food security" is an important issue related to genetic engineering and conservation. Genetic diversity insures that there is a higher probability that some organisms will survive in a variety of environments. Biotechnological applications may reduce genetic diversity because of the economics involved in adoption of high-yielding plants or plant types that are resistant to noxious stimuli. Genetic conformism will heighten a species' susceptibility to a single virus or bacteria. Conservation activities can then be impacted by food shortages that would bring fragile land into production.

Information and Equipment Technologies

Overall, information technologies can work hand-in-glove with biotechnology to reduce agrichemical applications, water requirements, energy use, soil loss, and water degradation. However, just as with biotechnology, the impacts of computer and information technologies have barely scratched the surface. Although only approximately 10 percent of farm producers currently own microcomputers (Goe, 1986), adoption may be phenomenal in the next two decades. USDA agencies have just recently purchased microcomputers for field offices. In addition, off-farm remote sensing technologies are in the initial stages of applications by the Department of Agriculture. In conservation activities, these remote sensing technologies have become an important way of gathering natural resource information without ground surveys. These technologies include satellite imagery, aerial photography, ground-penetrating radar, telemetry (for snow surveys), lasers, and airborne profile recorders.

Computers also perform on-farm production and management functions. These applications lead to highly efficient monitoring and control functions related to integrated pest management, temperature sensing, irrigation schedules, moisture levels, instrument depths, feed schedules, and chemical spray rates. Computer software packages are also having an impact on business planning, decision-making, management, and marketing. For the most part, software development in these applications and management areas has been for general purpose packages rather than custom programming. This will likely change when programming becomes easier through verbal/auditory-sensitive computers so that operators, themselves, can develop specific programs or modify existing software.

Public agencies at the local level may also develop software for the needs of their clientele.

Issue: What impacts will the expanded use of information systems computer technology have on soil and water conservation?

Microcomputing power in the hands of field-based conservationists will eventually enable more specific assessments of erosion rates, off- and on-site environmental impacts, and the economics associated with soil loss. Furthermore, conservation planning will be quicker, more specific, and present a greater number of workable alternatives. Thus, ironically, computers will personalize conservation services, which could give on-farm conservation evaluations more credence. Computer technology is growing, but good software applications for farm management systems are needed. Information technologies will play an increasing role in agricultural management and in information storage and retrieval. New video cassette technology to train conservationists and inform farmers and ranchers on soil and water conservation issues will have a significant impact on the Agency's way of transferring technology. Significant gains in communications can be realized by the use of satellite technology, VCR's, and microcomputers with adequate software systems.

On-farm information computer applications and telecommunication systems can theoretically enable all segments of the agricultural community to benefit from these technologies. However, the computer revolution will initially have a greater use by those who serve producers than by producers themselves. Potential dispersion of benefits could be egalitarian due to the decentralized, stand-alone power of

microcomputers. Practically, however, the adoption of computers will proceed with agribusinesses and large operators being the first to adopt these assorted technologies. Several of the current and forthcoming biotechnologies are heavily computer-based, such as the coordinated feed and lactation systems for dairy cows. For another example, food and fiber production in highly controlled environmental settings (e.g., mushrooms) are being adopted by highly capitalized corporations. This means that larger operators will have technological advantage in this area, contributing to further consolidations in agriculture. The application of these technologies may contribute to an increase in vertical integration of the food system such as has already occurred in the poultry industry.

As farms have become larger, conventional farm equipment has also become heavier, and more powerful. Terraces, hedgerows and shelter belts have been plowed out to permit the unrestricted operation of the larger equipment. Contour planting has also decreased in popularity because of the difficulty of maneuverability. In these cases, the results have been an increase in soil erosion (U.S. Congress, 1982).

An animal production system currently being adopted can have positive implications for conservation. Systematically moving animals through some type of grazing management system, along with a moderate stocking rate, prevents overgrazing rangeland. Fencing provides multiple pastures, paddocks, or "cells," thereby enabling producers to regenerate and maintain ground cover in some areas, while grazing their animals in other areas. Recent improvements in electronic fencing have led, in

some cases, to less costly outlays than conventional fencing. Thus, rangeland can be protected without sacrificing economic returns.

Conservation Tillage

Conservation tillage (CT) has already had an impact on soil erosion and has a huge potential to reduce soil losses even further. CT leaves at least a 30-percent crop residue cover on the soil surface following planting. CT systems include no-till, ridge-till, mulch-till, and strip-till. Soil loss reductions range from 50 to 90 percent with these systems. In general, research has found that CT is profitable because of the lower machinery, fuel, and labor costs associated with its use. Although yields vary, it has been found generally that they are comparable to conventional tillage systems. In fact, the major reason producers often give for adopting CT systems is in the realm of economics, not conservation.

According to the 1986 Spring National Survey of Conservation Practices (NACD, 1986), conservation tillage was used on 71.8 million acres, or 34.4 percent of all acreage planted to corn, soybeans, small grains, and grain sorghum. The highest percentage of corn acres in conservation tillage was in the Corn Belt (45.6); the highest percentage of grain sorghum acres was in the Northern Plains (50.9). According to one USDA study, the Corn Belt and the Northern Plains had the highest rate of adoption for conservation tillage (Magleby, et al., 1985).

Although projections on future adoption of CT vary, they are unanimously optimistic. For example, by the year 2000, the Office of Technology

Assessment estimates an approximate 70 percent adoption rate (1982). Physical factors (e.g. soil type) and personal characteristics (management abilities) are some obstacles impeding the adoption of CT.

Issue: What impact will the continued increase in the use of conservation tillage have on soil and water conservation?

The emergence of this technology was made possible in the seventies through the development of agrichemicals, which provides a synthetic way of managing insects, mites, weeds, and other pests. Although CT can easily become a savior in the battle to fight soil losses, it can also lead to unforseen negative impacts on the environment. These impacts can be related to mismanagement of the technology (e.g., applying more chemicals than is necessary) or percolation and runoff of agrichemicals. The mismanagement factor can be minimized if producers who use CT systems also subscribe to integrated pest management systems. This situation is not unique to CT. Agrichemicals are also used in conventional tillage, and can just as easily be mismanaged as in the case of CT.

Several long-term issues need to be considered relative to the use of agrichemicals in production agriculture. The potential absorption of chemicals into the tissues of plants and their subsequent transfer to people consuming or using agricultural products is a serious issue that can have tremendous impacts on the health of the nation. Another major issue concerns surface and ground water pollution. If this occurs, an appropriate question to ask is who pays for cleaning up a spoiled environment. In the case of ground water, the more crucial question is: Can it even be cleaned up once it gets polluted? A major on-farm concern

is the potential harmful effects to the people who are exposed to these chemicals during or after application (Stokes and Brace, 1986). In both off-site and on-farm situations, it seems that evaluation of these issues requires more intensive efforts than those made to date. Policymakers appear to be more receptive to initiatives and farming systems that can simultaneously minimize government outlays, improve farm income, and also begin to address agriculture-related environmental degradation such as soil erosion and surface and groundwater contamination.

Implications of Technological Changes for Conservation

1. Biotechnology will have a significant impact on agricultural production and conservation. SCS needs to monitor the soil and water and other ecological impacts of new biotechnologies. SCS also needs to enhance testing and trials through cooperative or other partnership agreements.
2. Computer software and expert systems will be needed to enhance the ability of conservation professionals to assess new technology alternatives, and to stay up-to-date with information systems used by innovative farmers and ranchers.
3. Modern communications methods, such as satellite communication and VCR's, must be used to communicate with farmers and other landusers, who will be equipped with satellite dishes, VCR equipment, and other electronic media.
4. SCS will need to identify and assist in the development of alternative management systems that are economically and ecologically sound, locally acceptable, and do not adversely affect water quality.

OTHER CHANGES IN THE AGRICULTURAL ENVIRONMENT

International Factors

Worldwide, hunger and malnutrition are increasing, even in the face of oversupplies and stable or decreasing international agricultural prices. One billion people are estimated to be malnourished, with most of them living in third world countries (Latham, 1984). Underproduction of food for home consumption will continue in the earth's Southern hemisphere as mass tree removals lead the world's impoverished populations to use residues and manure for energy, rather than allowing these materials to be recycled into the soil. Soil erosion problems have increased, which contributes to food production problems for indigenous populations. At present, most good arable land is already under production. Newly cultivated land is usually marginal land, which leads to low yields, high erosion levels, and off-site problems.

Production for export has long been the policy of many underdeveloped countries. Exports are necessary for these countries so they can increase foreign exchange earnings to pay for mounting debts to the industrialized countries, the public international banking sector, and private banks. Not only are large U.S.-based multinational banks major lenders to third world countries, but many regional U.S. banks and smaller local banks are also directly involved in these loans. Some smaller banks are also indirectly linked through their deposits in the larger banks (Clearfield, 1985). Thus, theoretically, to prevent a disastrous chain of events that would begin with third world countries defaulting on their loans, U.S. agricultural producers might be in the unenviable position of supporting financial bailouts for these countries

in order to preserve U.S. agricultural funding. These same third world countries also heavily subsidize the competitors of U.S. farmers.

Producers in the United States are caught in political and economic macro trends that have a tremendous impact on their abilities to survive. U.S. food policies, Europe's Common Agricultural Policy, unfavorable exchange rates, the Russian grain embargo, high interest rates, and increased competition from third world producers are just a few influences that have reduced commodity prices for U.S. farmers. In this highly charged, competitive market, the rules of international trade change quickly due to political events. The international trading organization, the General Agreement on Tariffs and Trade, does not have jurisdiction over agricultural policies in spite of U.S. attempts to give it authority to oversee the international agricultural sector. Thus, international protectionist policies are fairly common. These factors have increased U.S. agricultural subsidies, which end up contributing to the federal deficit.

Issue: What are the implications of international agricultural trends for resource conservation?

In light of these influences, the long-term goals of conservation, although noble, are not rational to many U.S. producers who attempt to stay one step ahead of their competitors or their creditors. Moreover, the long term economics of conservation are not firmly established because, for one reason, technology masks the effects soil erosion has on production. By considering all these uncertainties, conservation may be perceived as an expensive long-term luxury to some producers.

Conservation systems that yield short-term positive benefits are more in line with these international trends.

Financial Stress of U.S. Producers

Going from the high-profit, export-oriented climate of the 1970's to the tighter, financially squeezed environment of the 1980's has caused extreme financial difficulties for many producers. Lower commodity prices, lower farm exports, and decreasing farmland values have collided to create an economic crisis for many agricultural areas.

In commercial agriculture, some farmers and ranchers are already out of business, and 20 percent show extreme financial stress (high debt load and negative cash flow) while 2 percent are considered technically insolvent, meaning that their debts exceed their assets (USDA, 1985). Nearly a third of commercial-scale farms (those with annual sales over $40,000) are having financial difficulties. These commercial farms represent only 34 percent of all farms, but account for 90 percent of total farm sales (USDA, 1985).

Unless there is an improvement in farm income, a drop in real interest rates, or substantial government intervention, many more farmers may become insolvent - up to one third in the next decade. Bankruptcies of this magnitude could generalize financial and social problems to agricultural lenders, suppliers, and other merchants. The very fabric of rural America as well as urban America could be dramatically affected (Reinders, 1986).

In fact, this process may already have begun. Rural communities, especially in the Corn Belt and the Plains States, have felt severe impacts of the financial crisis. Between 1983 and 1985, 137 rural banks in the U.S. failed, of which 107 specialized in financing agricultural activity. About three-fifths of these failures were in the Corn Belt and the Plains States (Gajewski, 1986). When banks adjust their financial portfolios to cover actual and anticipated loan losses, availability of credit for the community at large is affected. This, in turn, affects not only the local farm economy, but also the non-farm economy of the rural community as a whole.

Also, as a result of the farm financial crisis, institutional public and private takeovers have increased and are likely to continue. The Farmers' Home Administration, for example, has become one of the largest farm landlords in the United States. The estimated number of farm properties in FmHA's inventory increased from less than 300 in December 1979 to about 4,000--valued at almost $700 million--in October 1985 (U.S. GAO, 1986). According to the Farm Credit Corporation of America, the Farm Credit System, the nation's largest farm lender, has acquired 4,939 farm properties worth $1.2 billion (Schneider, 1986).

Issue: How will farm financial stress affect adoption and use of conservation practices?

Negative cash flows, plus high debt-to-asset ratios make adoption of conservation systems difficult. More and more producers are depending on off-farm income to supplement decreasing farm income, but this income is frequently needed to provide a reasonable quality of life for the farm

family. Low marginal returns and cash flow levels encourage producers to use low-cost, poor management practices, and to plant erosive high-profit crops, which could bring some marginal land into production leading to severe erosion and mining of the soil resource. On the other hand high income coming from off-farm employment can provide funds for conservation applications.

Implications of Other Changes

1. International conditions and trade practices will affect conservation initiatives and the success of conservation programs. Overproduction and the U.S. position as a world supplier of the last resort has resulted in very large agricultural surpluses. In addition, the recent decline in the value of the dollar and a drop in exports has placed U.S. agriculture in a negative net export position at a time when U.S. agriculture is cultivating fragile lands because of financial stress and the influence of some farm programs. These trends increase uncertainty and limit the opportunities for longer-term planning, which is an integral part of conservation planning and application.
2. The farm financial crisis will accelerate negative farm credit situations. Personal money is not available for soil conservation. This factor, along with decreased funding from SCS, is only partially compensated for by increased state and local funds. This may also result in exploitation of land to meet current financial needs. Furthermore, land grant university applied research in general has declined, affecting research on conservation--primarily, because of the diversion of funds from applied to basic research.

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